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WEATHER CAMERA, ACTION!

A METEOROLOGIST'S GUIDE TO THE SKY

REC

JET STREAMS

AN ATMOSPHERIC SUPERHIGHWAY

Imagine looking down on Earth from the deep darkness of space: its vast blue oceans, golden deserts, luscious forests, all topped and tailed by crisp, ice-covered poles.

But there's more. Clouds, and lots of them – big and small, swirls and blobs, bright and white – whizzing around on an atmospheric superhighway known as the jet stream.

Let's Get Moving!

Jet streams not only determine how and where weather systems form, but they also shift them around. For example, an area of cloud, rain and wind may start in eastern Canada, but could end up thousands of miles away in Europe – changing as it moves.

Hot Pursuit

Temperature differences in the **atmosphere** cause air to rise, fall and move around our planet, and it's the contrast between cold air at the poles and warm air at the **equator** that leads to jet streams.

The bigger the contrast, the faster the jet stream. Therefore, it moves fastest in autumn and winter, when the contrast between the increasingly cold poles and constantly warm equator gets bigger. In summer, it moves much slower, as the temperature contrast decreases.

Going My Way?

Planes can fly faster by hitching a ride on a jet stream. If they're moving in the same direction, the jet stream helps to carry the plane along and gives it a speed boost.

Don't Slow Down

Normally, jet streams smoothly flow around the Earth, keeping weather changeable. But when they bend too much, weather systems can slow down or even get stuck, causing spells of rain, snow, heat or cold that last for weeks or even months. This is how extreme weather can happen...

WIND

STIRRING THE AIR

Although we can't actually see the wind, we can see the big effect it has around us. But where does it all come from, and how does it move the weather?

Under Pressure

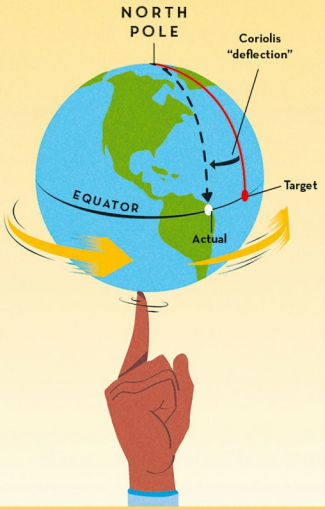
Wind is caused by differences in **air pressure**: the weight of air molecules pressing down on the ground. Imagine you're climbing a ladder: this is usually pretty easy, because nothing's pushing you down – that's low pressure. But if you tried to climb with a full backpack on, it would be much harder because it's pushing you down, and that's high pressure.

Areas of **high pressure** generally bring calm, settled weather. Air sinks towards Earth's surface, spreading outwards when it reaches the ground.

Areas of **low pressure** bring unsettled weather, and air rises upwards – away from Earth's surface.

Wind always blows from high to low pressure and it's this movement of air between them close to the surface that creates wind.

I often mention high and low pressure in my weather forecasts. It's a handy way to give everyone a clue as to whether they'll have to hold on to their hats or not!



You Just Spin Me Around

In the **northern hemisphere**, wind blows clockwise around high pressure and anticlockwise around low pressure. But in the **southern hemisphere**, that's reversed! This is due to the **Coriolis effect**, where the spinning motion of Earth causes wind to be deflected (curve) to the right in the northern hemisphere and to the left in the southern hemisphere.

Wherever the Wind Blows

If you know the direction that the wind is coming from, you can work out the weather that it's bringing your way. For example, if you live in Europe and have a northerly wind in winter, it'll come from the **Arctic**, so it'll bring cold air and possibly snow. If there's a southerly wind in summer then it'll come from Africa, bringing hot air, clear skies and perhaps even thunderstorms.

If the air pressure changes a lot over a short distance, then you're in for strong wind.

If the same change happens over a longer distance, the wind doesn't move so fast, so it's weaker.

How Are Your Grades?

The strength of the wind depends on how much the air pressure changes over distance. This change is called the 'pressure gradient'.

AIR MASSES

WEATHER ON THE MOVE

Every time we step outside, the air determines how we feel and the clothes we wear: warm or cold, wet or dry, season to season and day to day. So why does it change? That's up to air masses.

Weather on the Move

Air masses are huge bodies of air that roam our planet, covering whole countries or even continents and reaching high into the atmosphere. Each air mass has a particular temperature and humidity (moisture content) which determines how it's described and the weather it brings.

How to Name the Air

To make them easy to recognise, we describe air masses by which **climate zone** they come from (polar, Arctic, **tropical**, **equatorial**), and if they start over land (**continental**) or sea (**maritime**). An **air mass** from the Caribbean Sea in the tropics would be warm and moist, so that's 'tropical maritime'. An air mass from Canada would be cold and dry, so 'polar continental'.

Making an Air Mass

Even rooms in your house can have different air masses. After a shower, your bathroom's air would be warm and **humid**. However, when you go to an air-conditioned bedroom afterwards, it would be cool and dry. If you put a fan on, you could move the cool, dry air into the warm, humid room and change how it feels. Air masses move and change too. A polar continental air mass moving over the sea can pick up moisture and turn polar maritime. But when air masses get stuck where they wouldn't normally be, they can really stir up trouble...

War of the Winds

In the winter of 1962-63, the United Kingdom had its coldest winter in over 200 years, as Arctic air lingered for two months. I remember my mum telling me about it. She said that it was a winter that never seemed to end! Lakes and rivers iced over, and each time tropical maritime air from the Atlantic Ocean tried to move in, the collision with the Arctic air led to huge snowfalls. A **blizzard** built snowdrifts up to 6 metres high, cutting off villages and freezing farm animals to death. The battle raged for much of the winter before the Arctic air finally surrendered and eased away.

TROPICAL WEATHER

DODGING THE DOWNPOURS

Vast forests swelter in the tropical regions of our planet, their hot air full of moisture. This moisture helps the rainforests grow, but also builds towering clouds and thunderstorms, whose downpours drench the swamps and rivers to keep them full for animals and vegetation. This weather isn't driven by jet streams but is caused by the intertropical convergence zone (ITCZ).

Cutting the World in Half

The **ITCZ** is a zone of low pressure around Earth. If you look at a **satellite** photo, you can see it in the bright white clouds circling the middle. Each year, the ITCZ drifts north and south between the **Tropic of Capricorn** and the **Tropic of Cancer**, across a line called the equator which divides the planet into northern and southern halves, known as hemispheres. The Tropic of Cancer and Tropic of Capricorn mark the edges of Earth's tropical climate zone, and are 2,600 kilometres north and south of the equator.

Who Needs Four Seasons?

In the tropics, there are two clear seasons: a wet **monsoon** season, and a dry season. These can last for weeks or months. Wet seasons arrive late spring into summer, because the ITCZ follows the sun's heat. In the northern hemisphere, this is from May to July, and in the southern hemisphere, it's from November to January.

Clue's in the Name

But what causes the ITCZ? Surface winds from each hemisphere crash together – or converge – forcing air up into the sky. The air here is hot and humid from the heat of the sun and warm oceans, but as it rises, it cools and condenses into water droplets (like hot steam on cold glass) or even freezes into ice crystals. These droplets and crystals are the building blocks for huge clouds, which bring showers, heavy rain and thunderstorms.

The Calm Before...

The ITCZ weather might sound calm and simple, but as it moves north and south, its monsoon rains can build the thunderstorms that birth powerful, dangerous weather events like **hurricanes**, typhoons and tropical cyclones...

Stuck in the Doldrums

Weather can sometimes be calm in the ITCZ with very little wind. Historically, sailors called this area 'the **doldrums**', and the light winds were a nightmare when they needed strong **gusts** to blow them along. That's where we get the phrase 'stuck in the doldrums'.